

kind that the "movement is produced in the sthenometer by some unknown force emanating from the right and left hands that can move a straw over a very considerable arc." It was shown, however, by Messrs. F. J. M. Stratton and P. Phillips in the *Journal of the Society for Psychical Research* for December, 1906, that heat radiated from the hand is the cause of the motion of the balanced straw of the sthenometer. Hot objects were observed to produce the same effects, and the extent of the motion was found to increase with the heat radiated from the hand as indicated by a thermopile. With the results of these experiments before us, and also a note by Mr. Stratton in the March number of the *Journal of the society*, it is difficult to understand why the effect described should be supposed to be produced by an unknown force. Much more substantial evidence will be required than that adduced in the article in the *Contemporary Review* before any firm foundation can be secured for the position taken up by Dr. Schofield.

THE three official articles, on the work done at the Physikalisch-Technische Reichsanstalt during the year 1906, which appeared in the April, May, and June numbers of the *Zeitschrift für Instrumentenkunde*, have now been issued as a separate pamphlet. In addition to statistics showing how the work of the institution is growing, short summaries of the principal conclusions arrived at during the course of the year's work are given, and greatly enhance the interest and value of the publication. As typical examples may be mentioned the paragraphs on the expansion of bodies at very high and at very low temperatures, on the comparison of the various temperature scales at high temperatures, on the self-inductance of lead-covered and other cables, and those on the comparison of the methods of testing magnetic materials. Apart, however, from its scientific value, there is one feature of the report which teaches us an important lesson, that is, the close contact which exists between the institution and the manufacturers of Germany. Almost every official, from the president downwards, has spent some time during the year in visiting the works of clients of the institution, "um persönlich Gefühl mit der Industrie zu nehmen," to quote the words of the report. How long will it take us to learn this lesson?

AN important series of determinations of fundamental atomic weights is described by Prof. T. W. Richards, in conjunction with several of his students, in No. 69 of the *Publications of the Carnegie Institution*. The atomic weight of potassium was determined by ascertaining the ratio of the weight of potassium chloride to that of the silver chloride it produces when precipitated by means of almost exactly the theoretical quantity of silver nitrate. By using a Gooch crucible with a matting of platinum sponge the weight of the silver haloid formed could be determined with a high degree of accuracy, a correction being introduced for the minute quantities of silver chloride retained in the mother liquors. A similar series of determinations was also made with potassium bromide by converting the latter into silver bromide. In both series exactly the same value, 39.114, for the atomic weight of potassium was obtained ( $\text{Cl}=35.473$ ,  $\text{Br}=79.953$ ). Determinations were also made, introducing many new refinements, of the weight of silver nitrate formed from a known weight of silver; the results are of especial interest, inasmuch as they are incompatible with the low value recently advocated for the atomic weight of nitrogen if the atomic weight of silver be taken as 107.93; assuming this value, the atomic weight of nitrogen becomes 14.037.

NO. 1968, VOL. 76]

The atomic weight of sulphur was also determined by a new method based on the conversion of silver sulphate in a quartz tube into silver chloride by means of gaseous hydrogen chloride. The change takes place in a manner very favourable to accurate results, and gives a value 32.113 for the atomic weight of sulphur ( $\text{Ag}=107.93$ ), which is considerably higher than that accepted hitherto. An interesting account of the general principles underlying recent determinations of atomic weights was given by Prof. Richards in a lecture delivered before the German Chemical Society, and printed in the current number of the *Berichte*.

THE Board of Agriculture has published colour-printed geological maps of Worms Head (Sheet 246). The map is issued in two editions, price 1s. 6d. each, on one of which (the solid edition) glacial deposits are omitted, while on the other (the drift edition) such deposits are indicated by colour. The scale is 1 inch to the mile.

THE latest list issued by Messrs. Voigtländer and Son, of 12 Charterhouse Street, E.C., is a handsome production. It contains numerous examples of photographs taken with various types of lenses made by this firm, and is in addition provided with an excellent introduction by Dr. H. Harting on the selection of photographic lenses and cameras.

THE Livingstone College Year-book for 1907 contains the annual report, extracts from letters from old students, hints on diet and hygiene in the tropics, &c. The college gives a training in elementary medicine and surgery to missionaries, and is doing much good work.

DR. M. MOSZKOWSKI has translated into German Prof. T. H. Morgan's work on "Regeneration," and the volume is published by Mr. W. Engelmann, Leipzig, at the price of twelve marks. Prof. Morgan has provided his translator with new material relating to facts and theories of scientific importance published since the first or English edition appeared in 1901, and this has been incorporated in the German edition. At the end of the chapter on the theories of regeneration, Prof. Morgan states the views he now holds concerning some questions of fundamental interest.

#### OUR ASTRONOMICAL COLUMN.

COMET 1907d (DANIEL).—Several observations of this comet are recorded in No. 4188 of the *Astronomische Nachrichten* (p. 207, July 4). Observing at Kressmünster on June 24, Prof. Fr. Schwab saw a nebulous body of about 2' diameter with a bright nucleus; the comet disappeared in the dawn simultaneously with stars of the ninth magnitude. Mr. van Biesbroeck, with the 15-inch refractor at Uccle, found the magnitude to be 8.5 for the whole comet, on June 19, this being decidedly brighter than on the previous day. On June 27 Prof. Hartwig saw a bright centrally-placed condensation. On July 4, Dr. Lappa, observing at Rome, found the magnitude of the nucleus to be between 6.0 and 7.0.

This object now rises about midnight, about four hours before the sun, and may be seen with a good field-glass.

COMET 1907c (GIACOBINI).—Dr. Strömberg continues his daily ephemeris for comet 1907c in No. 4189 (p. 223, July 6) of the *Astronomische Nachrichten*, and carries it forward to July 31. This object is now travelling in a south-easterly direction through the constellation Virgo, and its brightness is only about half that at the time of discovery, its magnitude then being 13.0.

THE ORBIT OF  $\alpha$  CENTAURI.—Finding that his second set of elements does not represent the angles measured at periastron passage, and having many more observational results on which to base his calculations, Prof. Doberck has re-investigated the orbit of  $\alpha$  Centauri, and publishes

the result in No. 4189 (p. 209, July 6) of the *Astronomische Nachrichten*. In the new set of elements (iv) the eccentricity is given as 0.5057 and the period as 78.81 years. There are still differences between the observed and calculated positions which must be accounted for either by unusually large constant errors in the measures or by the presence of an invisible third body, the effect of which, in this case, would be enhanced on account of the large eccentricity of the orbit; an ephemeris for 1907.5-1936.5 accompanies the paper.

COMPARISON OF THE SPECTRA OF THE LIMB AND CENTRE OF THE SUN.—In No. 5, vol. xxv. (p. 300, June), of the *Astrophysical Journal*, Prof. Hale publishes an important paper showing the results of a comparison of the spectrum of the central parts of the sun's disc with that of the sun's limb. In 1879-80, Prof. Hastings showed that the modifications of the Fraunhofer spectrum at the limb were similar to those which obtain when a spot spectrum is examined, but to a much less degree. Recent work at Mount Wilson confirms this, and shows that the effect is greater than was previously expected.

The differences between centre and limb are plainly shown in three sets of spectra which Prof. Hale reproduces. All winged lines such as H, K, H $\gamma$  and the lines of the b group lose, to a great extent, their hazy borders, the latter, for example, appearing as comparatively hard, well-defined lines. Other lines, e.g.  $\lambda\lambda$  5156-823, 5219-875, 5426-474, which are intensified in passing from the Fraunhofer to the spot spectrum, are intensified at the limb, whilst still others, generally "spark" lines, are weakened at the limb as they are in spots.

There are, however, as shown by the preliminary examination, important differences in the changes undergone. Perhaps the most striking is in the winged lines the borders of which, at the limb, are universally contracted, whereas in spots the wings on the strong lines in the more refrangible portion of the spectrum are intensified rather than diminished. Another anomaly is that at the limb the lines of V and Ti, certainly the most affected in spots, are not so strongly affected as those of Mg, Fe, Ca, &c. Again, in spots, H $\alpha$ , like all the other H lines, is thinned, whereas at the limb this line is actually widened and perhaps strengthened.

The thinning of the spark lines is strikingly shown in a table in which the behaviour at the limb of twenty-seven of the more prominent enhanced lines of Fe, Ti, and V, as given by Sir Norman Lockyer, is exhibited. All these lines are considerably weakened in passing from centre to limb, and the majority of them have been observed similarly affected in spots.

A discussion of these results in their bearing on the solar theory is promised in a later paper.

THE ORBIT OF  $\epsilon$  ORIONIS.—A note by Mr. Plaskett in No. 3, vol. i. (p. 206, May-June), of the *Journal of the R.A.S. (Canada)* mentions the preliminary results obtained from the radial-velocity measurements of the spectrum of  $\epsilon$  Orionis. These show that the eccentricity of the orbit is 0.75, greater than that of any other yet known spectroscopic binary, and that the period is about 29.12 days.

METEOR AND FIREBALL OBSERVATIONS.—*Astronomische Nachrichten*, No. 4187 (p. 183, June 29), contains an account by Mr. Denning, of a first-magnitude Leonid observed on November 17 last. This meteor travelled along a visible path more than ninety-one miles in length at a velocity of thirty miles per second, a considerably lower velocity than that usually attained by Leonids. The height at the beginning of the flight was seventy-seven miles, at the end sixty-six miles, so that the path was very long and nearly horizontal, facts which may account for the low velocity, as the body would thus encounter considerable atmospheric resistance.

A fireball, observed over Yorkshire on November 23, 8h. 5m., was brighter than Venus, and appears to have proceeded from a radiant at  $46^{\circ}+5^{\circ}$ , a position near  $\alpha$  Ceti. From previous observations there appears to be a shower of long duration, or a succession of showers, from this radiant, Cetiids having been observed in September, October, and November, those in November furnishing the most brilliant examples. The mean position of the radiant is  $43^{\circ}+5^{\circ}$ .

## THE ROYAL SOCIETY OF CANADA.

THE annual sessions of this society, the premier scientific society in Canada, were held, as usual, in the capital city of Ottawa on May 13-16. The society, which was founded twenty-five years ago by the Duke and Duchess of Argyll (the Princess Louise and the then Marquis of Lorne), combines the features of the Royal Society of London and the French Academy. The number of fellows is very limited, and there are four sections, viz., French literature and history, English literature, &c., physics and chemistry, and biology and geology. There was an unusually large attendance from all parts of the vast Canadian dominion, and in Sections iii. and iv. the meetings were regarded as the best ever held.

Dr. Wm. Saunders, C.M.G., president of the society for 1906-7, and head of the Government Experimental Farms, gave his presidential address on the evening of May 14 in the presence of a distinguished audience, including Sir Sandford Fleming, Sir James Grant, Profs. Ramsay Wright, Penhallow, Prince, and Clark Murray, and representatives from most of the universities of Canada. The subject was "The Development of Agricultural Science," and it consisted of a masterly review of the history of farming from classical times to our own day.

The ancient Hebrews and Egyptians were the most proficient tillers of the soil in those distant ages, and the latter race was the first to raise domestic cattle. Amongst the Romans, agriculture was highly esteemed, and when luxury brought demoralisation, the noblest minds reverted to farming. "The earth," said one of these old Romans, "gives back what it receives with usury, and nothing can be more profitable or beautiful than a well-kept farm."

During the Middle Ages, only the wealthy ate wheat food; the poorer classes used rye, barley, and oats. But in the sixteenth century Raleigh introduced the potato into Ireland. However, when the Queen of England wanted a salad for luncheon, she had still to despatch a messenger to Holland.

Up to the eighteenth century land was sown until exhausted. By that time farmers had learned the alternate crop plan of conserving the strength of the soil, and at the opening of the nineteenth century they understood the value of manure as a fertiliser.

"It is highly probable," declared Dr. Saunders, "that the plant-life will always supply enough food for mankind, and the supposition sometimes advanced, that the rapidly increasing population will not find sufficient nourishment, seems far remote from probability."

Twenty-three years ago farming was in a very depressed condition in Canada. In 1884 a select committee of the Canadian House of Commons investigated the causes of this depression, and found it was due, not to poor soil or idleness, but to a lack of knowledge and skill in the farmers, and the committee recommended the establishment of experimental farms to promote agriculture and instruct the farmers. Accordingly, in 1886 a central farm was started near Ottawa, with four other branch farms in other parts of Canada. In agriculture, Canada is now pre-eminent among the nations, and even Egypt, the ancient farming land, is asking for samples of Canadian products that she may emulate this country in the pursuit of the farming industry.

Prof. Rutherford, F.R.S., was president of Section iii. (Physics), and gave an address on the life-history of radium, and other fellows of the society presented twenty-five original communications, while Prof. Edward E. Prince, Chief Commissioner of Fisheries, delivered an address, as president of Section iv. (Biology and Geology), on marine biology in Canada. Prof. Prince is the head of the three biological stations carried on by the Government on the Atlantic, the Pacific, and the Great Lakes shores, and his account of the progress of zoological research and of the investigations at the stations proved exceptionally interesting. Twenty-seven papers were read and discussed, including one, the first ever presented to the society by a lady, the subject being "The Islets of Langerhans in the Pancreas of Certain Fishes," by Prof. Swale and Mrs. Thompson, of Winnipeg. Prof. Adami, McGill University, gave a paper upon certain curious cases